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ROBUST SWITCH

This application is a continuation in part of application Ser. No. 10/388,555, filed March 14, 2003, which is a continuation of application Ser. No. 10/236,642, filed September 6, 2002, which is a continuation in part of application Ser. No. 10/163,546 filed June 6, 2002.

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates generally to the field of electrical wiring devices such as, by way of example only, electrical switches and receptacles of the type installed in building walls, and more specifically to a robust electrical wiring device system whose components may be modular and interchangeable and which provide a substantially unified blended appearance when combined with one another. The present patent specification describes such a robust system and, in whole or in part, is common to several patent applications whose claims vary and/or are directed to portions and/or components of the robust system.

Description of the Related Art

When modifying the wiring in an existing building, whether public, commercial or residential by adding a wiring device such as a switch, a receptacle or a combination of a receptacle and a switch, it is necessary to cut a hole in a wall of the building, install a box within the hole, attach the box to a vertical stud, for example, and install the wiring device(s) into the box. In new construction, the box is attached to a stud of an open wall and, thereafter, the wall, which may be sheet rock having an opening for access to the box, is placed over the studs. The conventional wall box has pairs of mounting ears for mounting the wiring devices to the box. After the wiring devices are connected to the various conductors they will service, each is fastened with threaded fasteners (sometimes referred to as bolts or screws, and these terms are used interchangeably herein) to a pair of ears on the box. The process of connecting a wiring device to various conductors and then attaching the wiring device with the attached wires to the box is done for each wiring device located within the box. Thereafter, a wall plate is typically positioned around or over each of the wiring devices in the box.

Typical installations can include a single wiring device or multiple wiring devices positioned side by side in a common box. In installations where there are multiple wiring devices in a common box, the installation of the wall plate can be time consuming. This is so because a wall plate for use with multiple wiring devices has a separate window opening for each wiring device. Thus, the wiring devices must be aligned with each other, must be positioned parallel to each other and must be spaced from each other by a distance that is dictated by the spacing between the openings or windows in the wall plate. Misalignment and positioning problems are often caused by wall boxes that are skewed relative to the wall or by walls which may not be flat. It is only after all of the wiring devices are accurately positioned relative to each other that a wall plate can be installed around the wiring devices. A wall plate that can be quickly and easily positioned around at least one wiring device is desired.

A common type of electrical wiring device in use today is the rocker type Decora-branded electrical switch whose activating member pivots about a centrally located horizontal axis. The trademark Decora is owned by the assignee of the present invention. To operate, the rocker switch actuating member is pushed in at the top to supply electricity to a load such as a light, and is pushed in at the bottom to disconnect the source of electricity from the load. Thus, with two or more rocker type of switches positioned side by side in a box, the actuating members of the switches can be in opposite positions at any one time. For example, with two rocker type switches positioned side-by-side in a box, what will be called the top edge associated with the "on state or position" of the actuating member of one switch will be flush with the top surface of the wall plate when in its on position while, at the same time, the top edge of the adjacent switch will be flush with the bottom surface defining the opening of the wall plate when in its off position. This in-out positioning of adjacent switches can also occur when both switches are in their on or off state if one or each of the switches is a 3-way or 4-way switch. The irregular in-out positioning of adjacent switches, particularly with 3-way and 4-way switches, can create operational uncertainty in the mind of the user as to which switch is in the on position and which switch is in the off position when subsequent activation or deactivation of less than all of the rocker switches is required by a user.

In those instances where multiple switches are positioned side by side in a common box, it is desirable that the switches always be in the same on-off position with each other regardless of whether they are in their on or off state.

SUMMARY OF THE INVENTION

There is disclosed a robust on-off switch operated by a paddle, the lower edge of which pivots in and out about its top or upper edge, the lower edge being urged by bias means to be in its out position when the switch is in both the "on state or position" and the "off state or position." The face of the switch is frameless and has, along its vertical axis, a contour of positive first differential and zero second differential, comprised of a combination of splines extending between points of varying distances from a datum plane. The contour has zero second differential when the rate of height increase of individual splines is constant.

The foregoing has outlined, rather broadly, a preferred blending feature, for example, of the present invention so that those skilled in the art may better understand the detailed description of the invention that follows. Additional features of the invention will be described hereinafter that form the subject of the claims of the invention. Those skilled in the art should appreciate that they can readily use the disclosed conception and specific embodiment as a basis for designing or modifying other structures for carrying out the same purposes of the present invention and that such other structures do not depart from the spirit and scope of the invention in its broadest form.

BRIEF DESCRIPTION OF THE DRAWINGS

Other aspects, features, and advantages of the present invention will become more fully apparent from the following detailed description, the appended claim, and the accompanying drawings in which similar elements are given similar reference numerals.

Fig 1 is a front perspective view of the wall plate installed around a rocker switch of a prior art device;

Fig. 2 is an exploded view of the switch, attachment plate and wall plate of the prior art device of Fig. 1;

Fig. 3 is a front perspective view of a wall plate in accordance with the principles of the instant invention installed around a switch;

Fig. 4 is an exploded view of the switch, alignment plate and wall plate of Fig. 3;

Fig. 5 is a front perspective view of the wall plate in accordance with the principles of the instant invention installed around a receptacle;

Fig. 6 is a front perspective view of the alignment plate for a single wiring device;

Fig. 7 is a front perspective view of the switch of Fig. 3 and an exploded view of a multi-function clip attached to each end of the ground strap of the switch;

Fig. 8, is a front perspective view of the receptacle of Fig. 5 and an exploded view of a multi-function clip attached to each end of the ground strap of the receptacle;

Fig. 9 is a front perspective view of the wall plate;

Figs. 10A-10D are sectional views along the lines 10A-10A to 10D-10D of Fig. 9.

Fig. 11 is a view along the line 11-11 of Fig. 9;

Fig. 12 is a side sectional view of the wall plate of Fig. 9 being held in place by the latching pawls of multi-function clips;

Fig. 13 is a fragmentary enlarged side elevation of the latching pawl of the multi-function clip engaging the saw-tooth rack of the wall plate;

Fig. 14 is a fragmentary, enlarged side elevation in section of the wall plate and tab of the alignment plate to indicate how the two components can be separated following latching;

Fig. 15 is an exploded view of a box, alignment plate and wall plate for two wiring devices;

Fig. 16 is an exploded view of an alignment plate and wall plate for three wiring devices; and,

Fig. 17 is an exploded view of an alignment plate and wall plate for four wiring devices.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring to Fig. 1, there is illustrated a front perspective view of a Decora electrical wall-type switch 18, a wall plate 68, as part of an assembly 10 of the prior art. Referring to Fig. 2, there is shown an exploded view of the wall box 13, switch 18, attachment plate 30 and wall plate 16 of the prior art device of Fig. 1. A suitable aperture is cut into a wall to provide access for the box 13 mounted to a stud 15, or to permit installation of a suitable box to an adjacent stud or directly to the material of the wall (such as plasterboard). The box 13 is chosen to be large enough to accept as many wiring devices as are needed to be mounted therein. The box 13 is made of metal or plastic, depending upon local Code requirements and has one or more openings in its sides or back to permit the introduction of electrical wiring or cables into the interior of the box 13. Box 13 has mounting means 19 to permit the box to be anchored to the adjacent stud 15. The box supports a pair of mounting ears 21 for each wiring device that is to be mounted within the box. Each mounting ear contains a threaded aperture 23 to which can be fastened the threaded mounting bolts (sometimes referred to as screws) of the wiring device such as, for example, rocker switch 18 or a receptacle. In the normal order of assembly, electrical cables are passed through knock out openings 17, for example, to the interior of the box. The ends of the electrical cables are stripped of insulation and attached to terminals (contacts) on the side or rear of the body 20 of the switch 18 or a receptacle. After the electrical cables are attached to terminals on the side or rear of the body of the switch, the switch is pushed into the box and held in position by screws (not shown) that are passed through clearance openings such as elongated mounting slots 25 and threaded into openings 23 of ears 21 so as to mount switch 18 within and to the box 13. Thereafter, attachment plate 30 is positioned around the front of the switch and secured to the switch with mounting screws 26 which pass through clearance openings 32 in the attachment plate and are threaded into openings 24 formed in the mounting/ground strap of the wiring device. Attachment plate 30 also contains a main aperture 34 of a shape complimentary with the profile of the front of the switch 18 which extends through it. The aperture 34 in Fig. 1 is rectangular to accept the front of the switch 18. The head of the screw which passes through aperture 25 of switch 18 and engages threaded opening 23 of mounting ears 21 is larger than the aperture 25 and, therefore, holds switch 18 captive to the box 13 and to the wall surface (not shown). In a similar

manner, the head of the screw which passes through aperture 32 of the attachment plate 30 and engages threaded opening 24 of the ground strap of the switch is larger than the aperture 32 and, therefore, holds attachment plate 30 captive to the switch 18.

At each of the ends 36, 38 respectively, of attachment plate 30 are two latching pawls 40, 42. Pawls or edges 40 and 42 are formed as extensions of attachment plate 30 but are thinner in cross-section. Each end 36, 38 also terminates in an angled leg 48 which extends at about a 45 degree angle with respect to the horizontal top edge of end 38 of wall plate 30.

Wall plate 16 is proportioned to fit around attachment plate 30 and over the front of the box 13 into which the single wiring device, rocker switch 18, is placed and to which it is fastened.

To attach wall plate 16 to attachment plate 30, pawls 40, 42 of attachment plate 30 are made to engage saw-tooth shaped racks 80 on the inner surfaces of end walls 70 and 72 of wall plate 16 as the wall plate is pushed in.

Fig. 3 is a front perspective view of a wiring device such as a switch 110 and wall plate 16 in accordance with the principles of the present invention; and Fig. 4 is an exploded view of the embodiment of the present invention illustrated in Fig. 3. Fig. 4 illustrates an alignment plate 114 (more fully disclosed in Figs. 6, 12, 15, 16 and 17 and the description that relates thereto) having alignment pins 118 positioned to engage what is described in this specification as a multi-function clip 130 (more fully disclosed in Figs. 4, 7 and 8 and the description that relates thereto) located on the ends 122 of the ground strap of switch 110 (more fully disclosed in Figs. 7 and 8 and the description that relates thereto). As shown in Fig. 2, (but not in Fig. 4) a box large enough to accept as many wiring devices as are needed is mounted in a wall. The box is made of metal or plastic, has one or more openings in its side or back to permit the introduction of cables into the interior of the box and has mounting means to permit the box to be anchored to an adjacent stud. Electrical cables are passed through knock out openings to the interior of the box and the ends of the electrical cables are stripped of insulation in preparation for attaching the cables to the switch. The box supports pairs of mounting ears. Each mounting ear contains a threaded aperture to receive mounting screws of a wiring device such as, for example, switch 110 (Fig. 4). After the wires in the box are attached to terminals on the switch, the switch is attached to alignment plate 114 by

multi-function clips 130 which engage alignment pins 118 on the alignment plate, and the switch and alignment plate are coupled to the box and wall surface by means of screws 108. Thereafter, wall plate 138 is placed around the switch, the alignment plate and the box assembly and held in place by outwardly extending edges or pawls at the ends of the multi-function clips which, in turn, engage saw tooth racks on the wall plate as described in detail below.

Referring to Fig. 5, there is illustrated an electrical wiring device such as a receptacle 520 located within the opening of a wall plate 138. Receptacle 520 is intended for 15 Amp. 125 VAC (illustrated) or 20 Amp. 125 VAC (not illustrated) and according to NEMA specification 5-15R, where each individual receptacle has two slot openings 524 and 526 for receiving the flat blades of a suitable plug and a semi-circular ground blade opening 528. The opening 526 is larger than the opening 524 so that a two blade plug can only be inserted in one way to maintain the correct electrical polarization. The larger slot is connected to the neutral conductor and by maintaining the correct polarization, the external metal parts of appliances such as toasters, TV's etc. can be grounded through the neutral conductor. The presence of the semi-circular ground blade makes insertion with the wrong polarity impossible.

Referring to Fig. 6, there is shown a perspective view of the alignment plate 114 of Fig. 4. Alignment plate 114, which can be composed of metal such as cold rolled steel or the like, is formed with a centrally located opening 116 sized to accept the body of a wiring device such as switch 110 or receptacle 520. Centrally located at opposite ends of the opening and contiguous with the opening 116 are two clearance openings 117 which provide clearance for mounting screws 108 which secure the switch 110 or receptacle 520 and alignment plate 114 to the box 13 and wall surface. Located beyond the outer edge of each clearance opening 117 are alignment pins 118. The alignment pins are used to engage openings (134 of Fig. 7) in the multi-function clips 130 attached to the ends 122 of the ground strap of the switch or receptacle. Alignment plate 114 supports a tab 120 that projects outward from an end (typically the lower end when on a wall) and is used to facilitate removal of a wall plate from around the face of a switch or receptacle. The outside dimensions of the alignment plate are such that it can extend beyond at least one dimension of the box in which the switch is installed. The alignment plate illustrated in Fig. 6 is formed or configured for a single wiring device.

The alignment plate 114 helps to overcome difficulties encountered with respect to mounting and positioning wiring devices such as multiple switches, a switch and a receptacle, or multiple receptacles to a box prior to attaching a wall plate. Some of the difficulties encountered are positioning the wiring devices to be in alignment with each other, positioning the wiring devices to be parallel to each other, adjusting the spacing between different devices to be equal and uniform and fixing all of the devices to be flat against the wall. These deficiencies are overcome through use of alignment plate 114 which has a single opening with no separating members sized to receive one or more wiring devices and having a pair of alignment pins 118 for receiving, holding and accurately positioning each wiring device. Each set of alignment pins on the alignment plate is located on a vertical axis which substantially defines the center for a wiring device and each wiring device has a multi-function clip at each end of the ground strap for frictionally and cooperatively receiving and holding captive the alignment pins. The alignment pins accurately position, align and locate all of the wiring devices relative to each other. The alignment plate is attached to the wiring device and this assemblage is attached to a wall box by means of mounting screws. Thereafter during the installation process, a wall plate can be positioned around the wiring devices without requiring further adjustments, and the wall plate is attached by simply pressing the wall plate in toward the wall.

Referring to Figs. 7 and 8, there is illustrated an electrical wall-type switch 110 and an electrical wall-type receptacle 520 around which the wall plate 138 can be positioned. The Switch 110 has an actuating paddle 111 that pivots about a pivoting axis at its upper end and is biased by a spring member to assume the same at-rest position when either it is in its on position or off position. Repeated pressing and releasing the face of the switch paddle 111 alternately closes and opens a set of contacts within the switch to alternately connect and disconnect a load such as a light from a source of electricity each time the paddle is pressed and released. Thus, regardless of whether adjacent switches are on-off switches, 3-way switches or 4-way switches, the top and bottom of adjacent switches according to the present invention will always be aligned with each other. An on-off indicator such as a light, flag, mechanical protrusion of the like can be provided to indicate to a user when the switch is in its on position or off position. The actuating paddle of the switch is not located within a frame and has a face surface which follows or blends with the contour and shape of the wall plate,

thereby presenting a substantially unified and aesthetically pleasing appearance. The paddle of the switch has a length-width ratio dimension that is proportioned to provide a finger contact surface of increased area to allow a user to more easily and quickly identify and operate a specific switch.

Switch 110 (Fig. 7) and receptacle 520 (Fig. 8) each contains a mounting/ground strap having ends 122 which provide support for the multi-function clips 130 by means of fasteners such as screws, rivets, spot welds or the like. Each end 122 can be rectangular in shape and supports two openings 126 and 128. Opening 126 can be oval, square or rectangular in shape and is a clearance opening for mounting screws 108 which can be provided by the manufacturer of the wiring device for attaching the wiring device to the box. The distance between centers of openings 126 in ends 122 on the ground strap is substantially equal to the distance between the centers of openings 23 in ears 21 of box 13 (see Fig. 2) to allow mounting screws 108 in openings 126 to engage and be held captive by the threaded openings 23. It is to be noted that clearance openings 117 in alignment plate 114 (see Fig. 6) are clearance openings for mounting screws 108. Openings 128 in the lugs 122 are clearance openings for alignment pins 118 of alignment plate 114.

Referring again to Figs. 7 and 8, the multi-function clips 130 can be composed of phosphor bronze, spring brass, spring steel or the like and are securely attached to the ends 122 of the ground strap of switch 110 or receptacle 520, by way of example. Each of the clips 130 contains a first opening 132 which is aligned during assembly with opening 126 in the strap end and a second opening 134 which is aligned during assembly with opening 128 in the strap end. Opening 132 can be oval or rectangular in shape to allow a mounting screw to be positioned off-center. A substantially centrally aligned projection 136 is formed so as to be bent at a slight downward angle toward the body of the switch, and is provided to engage and hold captive the threaded body of the mounting screw 108. Engagement of projection 136 with the mounting screw additionally provides a good electrical connection between the ground strap of the switch, the mounting screw and the box to insure that the switch or receptacle is connected to ground. The screw which passes through openings 132 and 126 of the switch or receptacle and opening 117 of the alignment plate 114, threads into opening 23 in the box to hold the switch or receptacle and alignment plate to the box . The openings 132 and 126 are sized to allow the screw to be moved laterally to compensate for slight

misalignments that may occur. Opening 134 in clip 130 is substantially circular and supports three inwardly projecting members bent upward at a slight angle away from the switch body. The ends of the three projecting members form an opening slightly smaller than the outer diameter of alignment pins 118 on alignment plate 114 and are designed to resiliently flex slightly as the alignment pin is inserted into and through opening 134 from the rear. The ends of the projecting members frictionally engage and hold captive the alignment pins to prevent the easy removal of the alignment pins from the clips. Located at the end of clip 130 are two tabs 140 similar to edges or latching pawls 40,42. The end of each tab 140 has a double bend similar to a zero to 360 degree sinewave curve and is provided to engage saw tooth racks 80 on the inside ends of the wall plate to hold the wall plate captive (See Figs. 9, 11, 12, 13 and 14, and the descriptions which relate thereto). It is should be clear by now and from the further description below that multi-function clip 130 is just that, a device according to the present invention which substantially simultaneously during assembly serves a plurality of functions in a manner unknown to the prior art.

The multi-function clip overcomes the difficulties encountered with respect to mounting one or more electrical wiring devices to a common box and then positioning the wiring devices relative to each other prior to attaching a wall plate. Some of the difficulties encountered when attaching a wall plate around wiring devices are, by way of example: positioning the wiring devices to be in alignment with each other, locating the wiring devices to be parallel to each other, adjusting the spacing between the different wiring devices to be equal and uniform and fixing all of the wiring devices to be flat against the wall. Each wiring device according to the present invention has at an end of the ground strap a multi-function clip that has locating openings for engaging alignment pins on the alignment plate. The pins on the alignment plate, when engaged by the close clearance locating openings in the multi-function clips, accurately positions the wiring devices relative to each other to allow a wall plate to be attached around the wiring devices without any initial or subsequent adjustment being needed. Each set or pair of alignment pins on the alignment plate are located on a substantially vertical axis which accurately defines the center of the wiring device, although it is within the scope of the present invention to provide other alignments, as well. The openings in the multi-function clips receive and hold captive a pair of cooperating alignment pins. The multi-function clips, in cooperative combination with the alignment pins, serve to

accurately position and align all of the wiring devices mounted on the attachment plate. After the wiring device(s) are attached to the alignment plate, the attachment plate and attached wiring devices are attached to a wall box by means of mounting screws which pass through the multi-function clips and attachment plate to provide a substantially flat rigid support for the wiring devices.

During assembly the electrical cables in the box are stripped of insulation and are attached to terminals on the side or back of the switch of receptacle. After the wires are attached to the switch or receptacle, the alignment plate is held vertically in front of the switch or receptacle and parallel to the switch or receptacle. The top of the switch or receptacle is now rotated what will be called downward from its vertical position, until it is horizontal and, while in its horizontal position, the end of the switch or receptacle that was initially up is passed through opening 116 of the alignment plate which is in its vertical position. After the switch or receptacle is passed completely through the opening of the alignment plate, the switch or receptacle is rotated back to its initial vertical position. At this time the alignment plate is positioned around the electrical wires and is located behind the switch or receptacle. The distance between the alignment plate and the switch or receptacle is now reduced until the front face of the alignment plate contacts the back face of the ends of the ground strap. As the alignment plate is caused to approach the wiring devices, or vice versa, the alignment pins 118 of the alignment plate enter openings 128 in the strap and openings 134 in clips 130. As the alignment pins enter the openings 134, they force the upwardly bent projections to resiliently move and spread apart to allow the alignment pins to fully enter openings 134. The ends of the upwardly bent projections engage and hold captive the alignment pins 118. The switch or receptacle which is now attached to the alignment plate and is connected to the electrical wires, is inserted into the box. As the switch is being inserted into the box, screws 108 located in openings 132 in the clips and clearance openings 117 in alignment plate are aligned with and threaded into openings 23 to hold both the alignment plate and switch or receptacle to the box and wall surface. The head of the screw which passes through opening 126 of the end of the mounting strap of the switch or receptacle and opening 132 in the clip is larger than either opening and, therefore, holds switch 110 and alignment plate 114.

The wall plate is now placed over the installed switch or receptacle. It is to be noted (see Figs. 3, 4 and 7) that the paddle of the switch 110 is not located within a frame. Thus, the

switch must be accurately positioned to insure that the paddle is free to move without contacting a surface of an adjacently positioned wiring device or the wall plate. Each multi-function clip 130 contains at least two projecting latching pawls 140. See Figs. 7 and 8. Each latching pawl has a double curve similar to a three hundred sixty degree sinewave-type curve. After the switch is attached to the alignment plate, the two latching pawls 140 of a clip are located on either side of the tab 120 on the alignment plate. Tab 120 functions as a tool pivot point to allow the wall plate 138 to be removed from around the switch or receptacle. A slot in the lower edge of the wall plate 138 provides access for the insertion of a small flat tool such as a screw driver to facilitate removal of the cover plate from the switch.

Wall plate 138 is proportioned to fit over alignment plate 114 as well as the box within which switch 110 or receptacle 520 is located. The wall plate 138 is located around the switch and held in position by pawls 140 which engage saw tooth shaped teeth on the wall plate.

Referring to Figs. 9-14, for a single wiring device, the width of the face of the switch is approximately 55% of the width of the wall plate along the horizontal axis and approximately 56% of the length of the wall plate along the vertical axis. The face of the switch has a vertical axis along its length and a horizontal axis along its width where the face of the paddle along its vertical axis has a contour of positive first differential comprised of a combination of splines down between points of varying distances from a datum plane and zero second differential when the rate of height increase of the individual splines is constant. The horizontal axis has a surface with a contour of a positive first differential and negative second differential comprised of a combination of splines drawn between points of varying distance from a datum plane. For a single wiring device, the wall plate is substantially 4.92 inches in length by 3.28 inches in width and has a single opening 100 with no dividing members for receiving a wiring device, either a switch or a receptacle that is substantially 2.82 inches in length by 1.83 inches in width. The width of the wall plate varies depending upon how many boxes are ganged together and the number of wiring devices that are to be located in side-by-side relationship. The front surface of the wall plate here disclosed has a complex or compound contoured shape such that the surface at the opening for the wiring device is further from the wall than it is at the outer edge of the wall plate. More specifically, referring to Fig. 10B, there is illustrated a view along the line 10B-10B of Fig. 9 of a portion of the front surface, along the horizontal centerline, between point K, the outer right edge, and point L, the

inner edge of the opening for the wiring device. As illustrated in Fig. 10B, the surface lies between two profile boundaries 0.002 inches apart, perpendicular to datum plane A, equally disposed about the true profile and positioned with respect to a datum plane. The basic dimensions and the profile tolerance establish a tolerance zone to control the shape and size of the surface. The surface is 0.726 inches in length. Within that length, a contour is defined by the dimensions of equidistant points which are 0.0726 inches apart. Each dimension indicates that point's distance to datum plane A, the back (flat) surface of the wall plate, which begins at point K. Moving from left to right, the dimensions increase from 0.228 to 0.287 inches. This progression indicates a shape or contour of increasing height, positive first differential, when the points are connected by individual splines. The points are not connected by a single arc and the rate at which the contour height increases is not constant. The rate of height increase of the individual splines decreases from left to right, and the second differential of the contour is negative. That is, the difference between the first point's distance dimension and the second is larger than the difference between the second and the third, etc. Thus, the surface has a contour of positive first differential and negative second differential, comprised of a combination of splines drawn between points of varying distance from a datum plane. This description substantially describes the wall plate's contours for sections along lines 10A-10A, 10C-10C, and 10D-10D of Fig. 9.

Fig. 10A is a section along the line 10A-10A of Fig. 9; Fig. 10B is a section along the line 10B-10B of Fig. 8; Fig. 19C is a section along the line 10C-10C of Fig. 9; and, Fig. 10 is a section along the line 10D-10D of Fig. 9.

The section along line 11-11, which runs along the vertical centerline of the wall plate defines a surface having a positive first differential and zero second differential, comprised of a combination of splines drawn between points of varying distance from a datum plane. This contour has zero second differential because the rate of height increase of the individual splines is constant; the difference between any two sequential point dimensions is substantially 0.0037 inches.

When the wiring device used according to the system of the present invention is a switch, the front surface follows the contours, and shape of the wall plate, so that their surface contours or lack thereof blend with one another to provide a substantially unified aesthetic appearance to the viewer thereof. In those instances where the wiring device is a receptacle,

the contour along the width of the front of the receptacle face is flat in one plane and the contour of the surface along the length of the face of the receptacle is convex with a constant radius that is greater than 10 inches and less than 40 inches, a preferred radius being substantially 30.724 inches. The shape of the front of the receptacle face is different from that of the switch primarily to allow for the proper seating of an inserted plug. The wall plate has no exposed mounting screws or other visible metal hardware. When the wall plate is attached to the switch, the only visible parts are the wall plate 16 and the switch or receptacle.

Referring to Figs. 11-14, formed in the bottom end wall 72 of wall plate 138 is a slot 74 which provides access to the tab 120 as is seen in fig 14. A small, flat tool blade such as a screw driver blade 76, or the like, is moved through slot 74 in end wall 72 to contact both the outer surface of tab 120 and the back wall of slot 74. By moving the blade 76 using the back wall of slot 74 as a fulcrum, the force applied to tab 120 will separate wall plate 138 from the switch or receptacle. To attach wall plate 138 to the switch or receptacle, the pawls 140 of clips 130 are made to engage saw-tooth shaped racks 80 located on the inner surfaces of the end walls 70 of wall plate 138. There are two racks on each end wall 70 of the wall plate 138. Each rack 80 contains a number of saw-tooth shaped teeth 82 each having an inclined front face 84 and a vertical back face 86. As seen in Fig. 13, as latching pawl 140 engages the inclined front face 84 of a tooth, the pawl deflects and moves past the tip of the first tooth 82. Once pawl 140 is past the tip of tooth 82, it can return to its initial position and take a position between the vertical back face 86 of first tooth 82 and the inclined front face 84 of a second tooth 82. This operation can be repeated as many times as needed to position the bottom edges of wall plate 138 as close to the wall as possible. As racks 80 and pawls 140 are independently operated, it is possible to locate the wall plate 138 to closely follow the wall contour, even when the wall is not flat. This ability to follow the wall contour is even more appreciated where the wall plate 138 is large, such as with a wall plate that is positioned around a multitude of wiring device.

Once the latching pawl 140 returns to its original position, it becomes difficult to dislodge the wall plate 138 from the pawl 140. However, as tool 76 can apply a great deal of force to tab 120, it is possible to separate the pawl 140 from engagement with the teeth and thus the wiring device from the wall plate.

Referring to Fig. 15, there is illustrated a wall plate for two wiring devices positioned side by side. It is to be noted that there is no partition or dividing member located in either the wall plate opening or the alignment plate opening to separate the two wiring devices. The two wiring devices can be placed in a double ganged box 160 made up, as an example, of two single boxes joined by fasteners 162 extending through the threaded apertures 164 of two joining ears 166. Alignment plate 114 has a single opening 116, four clearance openings 117 and four alignment pins 170 for receiving two wiring devices such as two switches, a receptacle and a switch, or two receptacles.

Looking at the wall plate 138, there can be four racks 80 on the interior of the top and bottom end walls for receiving four pawls where the two center racks receive one pawl from each wiring device. Also, there can be two tabs 120, which will be accessible via slots 74 in end wall 70 of cover plate 138. Because of the independent operation of the pawls 140 with their respective racks 80, the wall plate 138 can compensate somewhat for lack of flatness of the wall in which the wiring devices are installed.

Referring to Fig. 16 there is shown an alignment plate 114 having a single opening 116 and a wall plate 138 for three wiring devices mounted in three boxes (not illustrated) ganged together. Wall plate 138 has a single opening 100 with no dividing or separating members for receiving three wiring devices positioned side by side and can have four sets of racks 80 where the two end racks each receive a single pawl and the two center racks receive two pawls. The alignment plate 114 has a single opening 116 with no dividing or separating members, three sets of clearance openings 117 and three sets of alignment pins 170 for receiving three wiring devices.

Fig. 17 shows an alignment plate 114 having a single opening 116 with no dividing or separating members and wall plate 138 for four wiring devices mounted in four boxes (not illustrated) ganged together. Wall plate 138 has a single opening 100 with no dividing or separating members for receiving four wiring devices positioned side by side and the alignment plate 114 has a single opening 116 with no dividing or separating members for receiving four wiring devices positioned side by side.

The present invention contemplates a system wherein multiple electrical wiring devices in numbers not expressly set forth hereinabove may be utilized, without departing from the spirit or lawful scope of the invention.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to the preferred embodiments, it will be understood that various omissions and substitutions and changes of the form and details of the devices illustrated and in their operation may be made by those skilled in the art without departing from the spirit of the invention.